Opportunity amidst disruption
How energy transformation is shaping Canada’s utilities sector
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Opportunity amidst disruption: Executive summary

The utilities sector in Canada and around the world is experiencing a profound transformation unlike anything seen before in terms of scale, scope and speed. For Canadian utility companies, this transformation is impacting long-held business models—and compelling executives to chart a new path forward in a shifting and uncertain landscape. Opportunity amidst disruption: How energy transformation is shaping Canada’s utilities sector explores how Canadian utility executives and customers are responding to this changing energy landscape—and what the future may hold.

Our report identifies four transformational forces that are driving this rapid and relentless wave of change: technology, policy, customer expectations and innovation. New technologies are changing how utility companies in Canada and around the world generate, transmit and distribute power and gas—and enabling their customers to generate and store power themselves. Government and regulatory policy is forcing energy companies to continually adapt as legislators and regulators push for greener, more efficient and more flexible energy markets in their jurisdictions. The role of the customer is also changing, influenced by the seamless, cross-platform experiences customers have with their financial institutions and favourite retailers. And tackling these changes increasingly demands that power companies and utilities invest in innovation to bring new products and services to market.

It’s difficult to predict with any certainty what Canada’s energy market will look like 25 years from now. But what is certain is that it will be very different.
**Key findings**

Transformation is already happening

Three quarters of Canadian utility executives expect to see “some” transformation of their energy market over both the short-term, to 2020 (73%), and long-term, by 2040 (75%) (Fig. 1). Notably, 18% of executives feel their market will undergo dramatic changes by 2020, which may reflect the impact of recent policy changes at both the federal and provincial levels. Ontario and Alberta respondents were more likely to foresee dramatic changes in their local energy markets over the long term.

Two-thirds (66%) of executives believe the emphasis on renewables is a major factor driving transformation overall, along with conservation initiatives (48%) and subsidies and grants for new technologies (39%). All of these, of course, can be connected to government efforts to reduce energy consumption and reliance on fossil-fuel generation technology.

The energy trilemma: Sustainability takes the lead

There’s a constant, ever-shifting tension in energy markets between three key elements: security and reliability of energy supply, the need for clean and sustainable sources of energy, and keeping energy affordable (Fig. 2). Canadian utility executives believe that in the short term (2020), security of supply is the top priority in their province—reflecting, perhaps, that as markets shift to renewables, there’s an immediate need to ensure customers have the energy they need at all times. Over the long term (2040), the vast majority of executives expect that delivering cleaner, more sustainable energy will take precedence. This shift is also seen outside of Canada, with 61% of global utility executives seeing sustainability as the top priority now and 81% expecting sustainability to be the top issue in 2020. Both nationally and globally, many executives believe energy affordability will become a lower priority as energy markets transform to embrace new generation mixes and technologies.
Subsidies and conservation initiatives seen as major policy drivers of energy transformation today
Nearly three quarters (71%) of Canadian utility executives believe government policy and regulatory changes will impact their companies the most at this point in time—and they’re quick to identify the policy initiatives that are playing a major role. Sixty-six percent of executives say renewable energy subsidies are a key initiative driving transformation, 48% cite measures and programs promoting energy conservation; and 39% point to subsidies and grants for smart grid, storage and other new technologies.

The rise of distributed generation in Canada
New, advanced technologies are changing the way power is generated, transmitted, distributed and managed by business and residential customers. As utility executives look ahead, they see three technologies in particular playing a growing role in energy transformation over the next 25 years. Eighty-two percent of executives believe smart devices that autonomously tailor customers’ energy consumption to their unique needs will have a major long-term impact on energy markets by 2040; only 36% see smart devices having a similar impact in the short term (2020).

But distributed generation is the technology expected to have the greatest impact on energy markets across Canada, highlighted by 93% of executives. As solar technology becomes increasingly affordable and effective—and as efficient energy storage becomes a reality—more business and residential customers are expected to opt to self-generate some or all of their energy. It’s a shift that could significantly reduce power demand and revenue, while creating a far more connected and complex energy grid. But there are opportunities, whether from a gas/co-gen, solar, wind or storage perspective, to help enable and run these distributed generation solutions.

Electric vehicles, storage top of mind for distributors
Executives from energy retailing and distribution companies see electric vehicles playing an especially pivotal role in a transformed energy market: 93% feel electric vehicle adoption will have a major impact on their business by 2040, compared to only 36% who see this trend having a significant impact between now and 2020. Many expect municipal transit to be at the vanguard of the electric vehicle revolution—a shift that will provide the first indication of how well grids can deal with widespread adoption of electric cars.

Electric vehicles aren’t the only technology expected to have a large impact on energy retailing and distribution over the next 25 years. Eighty-six percent of Canadian utility executives expect smart grid technology, smart metering, new energy efficiency technologies and energy storage to play a significant role in reshaping this part of the energy sector over the next two-plus decades.
Canada sees more potential in storage than global counterparts

Canadian utility executives believe energy storage is a viable technology, compared to their global counterparts. Eighty-six percent of Canadian utility executives believe new storage technologies will play a role in transforming energy markets over the short term, compared to 44% of utility executives globally. Over the long term, 82% of Canadian executives see energy storage as a key component of a transformed energy sector, while only 47% of their global peers agree. Why do Canadians see energy storage as such a game-changer? It may be because our long experience with hydroelectric generation—where dams create literal reservoirs of stored energy—has given us a unique perspective into how storage can be used to improve the reliability and efficiency of our energy supply.

From asset-centric to customer-centric

Utility companies understand their customers are changing. They’re highly connected and becoming more and more demanding, with behaviours and expectations shaped by the seamless online experiences they enjoy shopping, banking or entertaining themselves online. In response, power companies and utilities are beginning to shift away from the asset-centric perspective that has dominated their thinking virtually since inception and have begun placing their customers at the heart of their business strategy. Almost all (93%) of the executives we surveyed say customer experience is important to their business, and their companies are engaged in a variety of engagement activities. But, there may be a disconnect between this belief and the 21% that feel customer experience is a major component of energy transformation; it may be that many companies underestimate the real importance of customer engagement in the energy market to come and have been lulled into a false sense of security by the current lack of competition.

Untapped value? Trust and transparency are powerful assets

Canadian energy consumers believe energy companies are the most trustworthy source of information about their energy use—above governments and governmental organizations, environmental associations, and academic or scientific bodies. Four out of 10 Canadian energy consumer respondents (39%) most trust their local energy provider or utility to inform them about actions they can take to manage or improve their energy consumption, a figure that rises to 54% in British Columbia and 53% in Manitoba and Saskatchewan. Independent consumer associations are seen as equally trustworthy in Quebec and slightly more so in Alberta—perhaps a reflection of the latter province’s more competitive market.

The strong level of trust Canadian energy providers enjoy is a tremendous asset, one that can serve as the platform to get strategic messages across or potentially sell new products or services as the market evolves. Ultimately, this paves the way for new revenue streams for companies, which are becoming increasingly important as the industry sees rising energy costs paired in many cases with reduced energy consumption.
Improving consumers’ energy literacy could pay dividends

The majority of Canadian energy consumers say they understand their energy bills to some degree (86%), but there’s much room for improvement. Only 35% of consumers feel they understand their bills completely. That figure rises to 44% in Quebec and falls to only 18% in Alberta, where a complex energy market results in equally complex energy bills (Fig. 3). Energy providers that help their customers understand their energy costs could also serve to reframe the conversation with a greater focus on the value of the products and services they receive. This could, in turn, lay the groundwork for future conversations and sales down the road—if energy companies can create enough opportunities for engaging their customers.

On average, Canadian energy consumers interact with their energy providers a mere four times a year, with almost a third (32%) only interacting one to two times annually—whether to pay or inquire about a bill, report or ask about power outages, start or stop service, monitor their energy usage or search for information about energy conservation. And when they do interact with their energy provider, consumers typically rely on phone calls or the web. Energy companies may be investing in social media to connect with their customers, but those customers aren’t yet responding: social media trails far behind the phone and web as a desired means to interact. Companies that can use data to better understand their customers and create new reasons to connect with them beyond the usual outages, service calls and bill inquiries could find themselves building a deeper, more holistic view of their business that uncovers more lucrative relationships.

In a transforming energy market, reacting isn’t enough

Canadian utility executives feel a number of market models could eventually evolve to take the place of current market models—ranging from green command and control to ultra-distributed generation with highly decentralized, local energy systems and regional super grids. Little wonder that 43% of Canadian utility executives say that existing business models aren’t sustainable in a transforming energy market, although they also believe that change will be gradual.

What do executives think the future holds for today’s energy companies? The predictions offer stark contrasts: While 52% envision a new golden age of utility reinvention, growth and success; 64% can just as easily see the role of power companies and utilities flattening or declining. A pessimistic 41% believe an industry death spiral is possible, driven by supply chain disintermediation, customer evolution and technological disruption (Fig. 4). This aligns with the views of their global counterparts, the majority of whom anticipate that a flat or declining role of power companies will be the most likely scenario in the coming years (89%).
Keeping an eye on new competitors
Canadian utility executives don’t appear to be especially worried about new competitors. Only 14% of executives feel competition from existing or emerging players will have the most impact on their companies over the short term—and that drops to 11% over the long term. Despite signs that technology giants and others are getting involved in the energy sector, Canadian executives are most concerned with domestic competitors: 55% believe utilities based in their province or elsewhere in Canada pose the primary competitive threat (Fig. 5). In contrast, global utility executives are far more likely than Canadians to view powerful retailing or technology brands as significant competitors in the years to come.

Affordability as a policy focus
Seventy-one percent of Canadian utility executives believe government policy and regulation have played a major role in driving energy transformation in recent years—much higher than the 51% of their global counterparts that feel the same way. It’s likely that Canadians’ perspective is shaped by recent moves by Canada’s federal government and the Ontario and Alberta provincial governments to accelerate the move away from fossil fuels in order to meet global climate change targets. Canadian executives actually expect the role of policymakers to diminish in the short term: only 39% believe government regulation will have a major impact on energy transformation by 2020. That contrasts with global energy executive respondents, who expect government influence to rise over the same period.

Canadian utility executives are also quite clear on where policymakers should focus their attention in years to come: 82% believe their provincial governments should prioritize making—or keeping—energy affordable, while 68% advocate efforts to encourage innovative technology, including distributed generation. Recent and emerging developments in energy technology may soon make it feasible to deliver on both these priorities. As well, a majority of executives support policies that promote energy security, energy efficiency and increased use of renewable energy sources.

Does today’s regulatory model hinder innovation?
Federal and provincial governments have taken many steps to evolve Canada’s energy markets by creating subsidies, grants and other incentives to promote renewables, energy-efficient technologies and more. Unfortunately, many utility executives believe regulators are inadvertently getting in the way of more rapid innovation. While two thirds of respondents (68%) believe their company’s business model is evolving with the pace of energy transformation, more than half (57%) say regulators are holding their company back. The reason may be a disconnect between government policymakers’ aspirations and the mandate and tools available to energy regulators themselves.

Figure 5: Percentage of utility executive respondents reporting high/moderate competitive threat from within the sector

Canada’s energy companies are ready for the challenge
As our survey research makes clear, Canada’s energy market is in the early days of a period of significant transformation, one in which the ultimate outcome isn’t yet clear. Canadian power companies and utilities are going to face many challenges as their business evolves in the decades to come. Addressing those challenges will require leadership teams to think about their business and their customers in very different ways.

Are Canada’s utility executives up to the task? We believe they are. As we examined the results of our survey, we also spent time in conversation with a number of executives across the country about how their industry is changing and how they and their companies are responding. In the pages that follow, we take a deeper look at each of the four key drivers of energy transformation to better understand how they impact Canada’s energy sector and what energy transformation looks like from where utility executives sit. What emerges is a picture of an industry in transition—and an industry whose players are ready to take on the challenges that await them.
Accelerating technological impact
A different path to gain competitive advantage?

Technological advances coupled with the consumerization of energy is driving rapid, significant transformation in energy companies across Canada, revolutionizing energy markets and disrupting business models in the process. These digital approaches and technologies—from renewables to storage to smart devices and more—offer utilities many opportunities to achieve greater efficiencies and accelerate their advantage in a changing, increasingly competitive marketplace. The challenge lies in determining which technologies to pursue and integrating them into the business effectively.

Within the next decade, it’s likely energy markets around the world will see a step-change in at least some of the disruptive technology that’s emerging today. Beyond-the-meter devices will become more commonplace. Electric vehicles will become more accessible. Cheap, effective energy storage could become readily available. In Canada, for example, 66% of utility executives foresee an ultra-distributed generation market model in place by 2040, one in which generators and customers have invested in distributed, renewable generation with investment decisions based on policy incentives, economic business cases or both. Anticipating and adapting to these developments could be key to thriving in the future.

Utility executives understand that technology-driven transformation will touch every part of their industry—though in the short term, they expect generation to experience the brunt of the change. Sixty-eight percent of respondents felt generation will experience a moderate to major impact from transformation by 2020, compared to 52% for distribution and 43% for transmission. This distinction largely disappears over the long term: 9 out of 10 respondents expect all three areas to experience significant change by 2040.

Not surprisingly, utility executives want to make sure technology is on government agendas. A majority of the executives we surveyed feel provincial governments and regulators should ensure they make new technologies a policy priority. More than two thirds (68%) say the provinces should encourage innovative technologies and distributed generation, and more than half (52%) believe the provinces should continue to encourage the development and growth of renewables.
A wave of opportunities—or threats?

From a generation perspective, executives believe natural gas will have the greatest impact in the short term (61%). Natural gas offers the cleanest fossil fueled option available to augment wind and solar generation. Flexible, readily switched on and off and currently inexpensive, natural gas will likely be around for some time—unless governments avoid it as a matter of policy. But over the long term, the falling cost of solar is viewed as having the biggest impact on the sector (86%) (Fig. 6). Solar’s impact will not only be felt in terms of commercial-scale solar generation facilities, but also in the myriad small solar generators put in place by residential and commercial customers alike.

It’s this kind of distributed generation that’s going to have the biggest long-term impact on transmission, according to 93% of respondents (Fig. 7). “If you think of the system fifty to sixty years ago, one-way power flows were the dominant generation supply. Today, increasingly, we have a more distributed generation that leads to this two-way power flow,” says Jack Simpson, Director of Generation and Capacity Planning with Toronto Hydro.

Over the long term, the falling cost of solar is viewed as having the biggest impact on the sector.
If widely adopted, distributed generation could cause demand—and likely utility revenue—to fall, while at the same time creating a vastly more interconnected and complex energy grid in which energy flows back and forth between energy companies and their customers depending on the time of day and weather. Distribution companies may come under increasing pressure to remain cost-competitive in this environment, but developments such as remote line surveillance and dynamic capacity could help even as demand fluctuates.

The utility executives we surveyed also believe smart meters and energy management devices will have an impact over the next two decades, from 50% in the short term to 86% in the long term. But it’s hard to pinpoint exactly what the impact of these devices will be, because it’s difficult to anticipate which technologies will ‘win’ and how widespread their adoption will be. It’s a question many ask of electric vehicles as well: while 93% of respondents said electric vehicles will have a major impact on the energy sector long term, much depends on the rate of their adoption and where they end up being located (Fig. 8).

With so much change—and so much of it yet uncertain—how do energy companies cope? “For the technologies that are viewed as a disruptor or threat to existing infrastructure, the key is to pick those off quickly and understand the implications to your business,” says Jeff Hilton, Vice President of Engineering and Emerging Technologies with Alberta’s ENMAX Corp. “When you can anticipate and plan for it, you can address it more quickly and more efficiently and I think you can minimize the disruption to your client base.”
Storage: The missing link

Storage technology remains the missing link of the energy sector’s transformation. Once it’s made viable, scalable and economical, the energy revolution will hit high gear. Eighty-two percent of those surveyed see storage having a long-term impact on energy transmission—rising to 86% in energy distribution and retailing.

“Twenty-five years from now, storage is going to be the most influential technology that’s emerging today,” says Hilton. “It’s going to be a game-changer—whether it’s lithium-ion batteries, flywheel technology, compressed gas or something else. Once we take away the immediate impact on supply and demand balance, it’s going to change everything.”

But first, the industry has to make storage technology viable. Toronto Hydro is among the companies attempting to do so, working with Toronto startup Hydrostor Inc. on a pilot that uses compressed air in an underwater storage accumulator which is the first of its kind. The utility is also working on lithium-ion battery storage together with eCAMION and Ryerson University.

“The industry is faced with a challenge in making energy storage cost-effective,” says Toronto Hydro’s Jack Simpson. The Hydrostor pilot, he says, has the potential to provide energy storage at a much lower cost, especially because they’ve used off-the-shelf equipment as a way to balance innovation with affordability.

Once storage technology reaches a scalable, cost-effective point—and this seems a matter of when, not if—it’s likely we’ll see significant disruption across the energy value chain as utility customers embrace self-generated, storable power. Yet Jack Simpson points out an unexpected benefit to a storage-driven energy revolution.

“If we can use energy storage proactively for 50 to 100 hours a year at a station, we may be able to defer conventional infrastructure investments five to ten years,” he remarks. “That time deferral is worth quite a bit of money, and that’s an option we’re actively studying today.”

Simpson’s comments drive home a fundamental truth about energy sector transformation: Utilities have to stay on top of technology trends as they develop and make sure they’re positioned to turn potential threats into opportunities—no matter how unexpected or unconventional.

Eighty-two percent of executives surveyed see storage having a long-term impact on energy transmission—rising to 86% in energy distribution and retailing.
Customer engagement
The new frontier for energy companies

Customers’ changing behaviours and expectations have become as powerful a driver of energy sector transformation as any technological advancement. With the sector at an inflection point, power companies and utilities that can develop a solid understanding of their customers’ needs and preferences—and deliver an outstanding customer experience across every point of contact—stand to realize a powerful advantage in the competitive market to come. Having an educated customer enables a much better interaction, which could drive cost reduction as well as increase customers’ willingness to better understand and take advantage of your service offerings.

Only 21% of Canadian utility executives believe customer experience plays a major role in driving energy transformation.

Customer engagement moves up the agenda
The energy sector is the latest industry to confront the impact of a rapid shift in consumer behaviour in recent years. Today’s customers are highly connected, very demanding and often very well informed. Their expectations have shaped—and been shaped by—the easy, seamless, cross-platform experiences provided by retailers and banks. They expect to be able to access information and do business when, where and how they like. And they’re bringing this outlook to their relationship with their energy providers. Customers don’t want a piece of new technology—they want that new offering to give them a simpler solution that suits their existing lifestyle. A service offering that provides a solution, but demands a behavioural change fails to offset the customer’s inconvenience.

Canada’s energy companies are taking steps to respond to the evolution of their customers. Ninety-three percent of surveyed utility executives say customer experience is important to their business, and those companies are trying to engage their customers through various means (Fig. 9): social media (73%) (Fig. 10), outreach programs and formal customer strategies (both 64%) (Fig. 11), and even sponsorship of events and cultural institutions (46%). But, only 21% of Canadian executives believe customer experience plays a major role in driving energy transformation, and that could be attributed to relatively low levels of disruption in the Canadian utilities sector. While it may be early days for energy companies’ customer engagement efforts, those who succeed stand to benefit greatly.
For Neetika Sathe, Vice President of Corporate Development at PowerStream, customer engagement is just as important as technology to energy companies’ future. “There is no choice. We have to be equally good at both. Customers want a high-touch, highly engaging customer experience,” she says.

Improving energy literacy could be one of the first big wins for companies’ engagement efforts. According to our national survey results, Canadian energy customers say they understand the basics behind their energy bill, but they’re hardly fluent: 86% of energy consumer respondents say they understand their bill charges at least somewhat, yet only 35% feel they understand them completely. That suggests there’s significant room for improvement—and since the energy bill is one of the most frequent touch-points with the customer, it’s well worth pursuing.

Hannah Bascom, Head of Energy Partnerships East for Nest Labs, feels that as technology improves, it will be easier to boost consumers’ energy literacy. Introducing advanced metering infrastructure (AMI), for example, makes a big difference. “I’m originally from the US Northeast, where there’s no AMI infrastructure in place, so consumers are still getting their monthly read. It’s a lot harder, if you have that one piece of information, to figure out what to do on a month-to-month basis to make any meaningful change, because there isn’t real-time feedback,” she says. In markets that have AMI, utilities can send customers high-consumption and bill projection alerts in a real-time way—giving customers actionable insights they can use to immediately adjust their energy usage.

Well-informed, energy-literate customers can be enormously valuable to any power company or utility. Informed customers will start to understand what goes on behind their bills—how the system works and where the charges come from. They understand the value of the products or services they receive, and how the energy value chain links together. They can use this base of knowledge to launch their own energy inquiries and learn more about their personal energy options. And that, in turn, helps establish grounds for constructive dialogue with their energy providers going forward.
Energy companies’ trust advantage
Rising energy literacy can also build customers’ trust in their energy providers and improve their perceptions of the sector overall. This can make it significantly easier for power companies and utilities to engage with customers about new products and services and increase customer value overall. Informed customers better understand the context their energy provider operates in—from provincial energy policy to the relationships between the companies reflected on their bill. Because they can see how new services and products fit into the bigger picture, they’re less likely to greet utilities’ overtures with skepticism. This can open the door to new revenue streams for companies, which will be vital in a world of rising energy costs and falling energy usage.

The good news is that when it comes to trust, Canadian power companies and utilities already have a solid foundation to build on. Nearly three quarters (73%) of Canadian energy consumers are satisfied with the services they receive from their provider, and 71% trust their provider can resolve any issues or concerns with energy bills, programs and services in a timely manner. And 39%—rising to over 50% in British Columbia, Manitoba and Saskatchewan—most trust their local energy provider to inform them about how they can manage or optimize energy consumption (Alberta customers are more likely to trust independent consumer associations for this information, while Quebec customers trust utility companies and consumer associations equally.) In fact, energy consumers are more likely to trust energy providers or consumer associations on these matters than they are governments, government organizations, environmental associations, or academic or scientific bodies (Fig. 12).

Where should power companies and utilities begin? Getting the basics right is essential. Clear, accurate billing information is non-negotiable. But companies can also strive to help their customers understand the modern energy market and its implications, challenges and opportunities with candour and transparency. Pulling back the curtain on how the system works today—and may work tomorrow—will strengthen the relationship with customers and encourage them to trust that their providers aren’t trying to hide unpleasant truths.

Conservation front of mind for consumers
Energy conservation is likely to be the focus of many companies’ customer engagement efforts. Eighty-nine percent of Canadian energy consumers say they’re at least somewhat interested in products to reduce energy consumption (Fig. 13). Consumers are keen to learn more about automated devices to manage home consumption (69%), home energy generation technology (66%), storage and backup generators (54%) and electric vehicles (52%). Clearly consumers want to know more about what’s on offer, and power companies and utilities are ideally suited to talk with them about it.

Figure 12: Most highly trusted organizations to inform energy consumers (by province)

Figure 13: Percentage of energy consumers that are somewhat or very interested in reducing energy consumption
For companies, these conversations are a powerful opportunity to engage and inform customers. But, the real value will come when companies can follow up on these conversations by offering end-to-end solutions to their customers’ unique energy goals. Making it as easy as possible for a customer to install home solar generation, for example—by providing assessment, design and installation services and financing—can both strengthen customer relationships and open up new revenue streams.

“Homes of the future will have nicely integrated, high-technology solutions that do one of three things: It will either help the customer save money, or make the customer’s life a lot easier or provide the customer with huge entertainment,” says Sathe. The challenge for energy companies will be to provide those solutions in full—and in a way that seamlessly slips into customers’ lives.

Relationships take work
Customer engagement may be high on the agenda for power companies and utilities, but that doesn’t mean engaging those customers will be straightforward. For one thing, opportunities for engagement are currently few and far between. On average, Canadian energy consumers interact with their providers four times a year—and typically rely on phone calls or the web for those interactions (Fig. 14). That’s hardly a robust framework on which to hang a customer engagement program, and it’s manifested in the fact that energy companies aren’t yet having many value-added conversations with their customers. True, companies are investing in social media as a means to connect with their customers, but consumers aren’t yet responding: social media trails far behind the phone and web as a means to connect with energy providers.

To improve customer engagement, power companies and utilities will need to reimagine the way they do things, being proactive in finding new reasons to connect with their customers beyond outages, service calls and bill inquiries. The status quo isn’t an option—forward thinking and solving future problems for customers are critical. Customer segmentation will be vital to identifying opportunities to reach out and engage customers about their energy use and new products or services. Demographics, location, energy use, preferred channels and more can all be used to uncover distinct customer segments, which can enable energy companies to fine-tune their messages and offerings to suit. While rural residents and urban dwellers may all want to save money on their energy bills, for example, their needs and motivations may differ greatly. In addition, the relationship changes when looking at customers who are moving from solely consuming electricity to generating and consuming electricity. These prosumers have new requirements and different expectations of the utility. An energy provider that understands these differences and reflects them in their communications and product offerings will be viewed more favourably by their customers. And that will open the door to new business opportunities.

Energy isn’t something the typical customer dwells on, remarks Sathe. A new granite countertop easily beats rooftop solar panels when it comes to customer interest. “Customer awareness is extremely low,” she says. “We have a long road to tread on. We need to get together to impart information and make it really fun and easy to understand for the average customer.”

Figure 14: Energy consumer survey: How many times per year do you interact with your energy utility company?
If you wanted to find a symbol for how technology is transforming the way we think about and manage energy use, the smart thermostat would be a top candidate. These devices learn their owners’ habits and behaviours and then use that data to adjust household heating levels automatically. The innovative technology behind the smart thermostat combines comfort and conservation—but Nest Labs’ Hannah Bascom believes the technology also taps into a customer need that’s just as essential today: convenience.

Bascom, Head of Energy Partnerships East at Nest Labs, believes customers’ expectations for convenience and automation are growing. “In this day and age, people expect things to be very seamless and very quick—and they don’t really want to have to think about it,” she says. “They want to set it and forget it.”

Bascom sees the connected, data-driven automated convenience of smart thermostats and other smart technology as a way to address consumers’ energy-literacy challenges. Most energy customers aren’t really that motivated to understand the nuances of their energy consumption, she contends. They want to maximize their energy savings; they don’t want to micro-manage their hourly kilowatt usage.

“What we aim to do is automatically help customers, and then figure out smart ways to educate them about how to increase their savings,” says Bascom. In addition to monthly energy reports offering practical energy-efficiency tips and tricks, the company also deploys special programs over the Nest software platform. Nest’s seasonal savings program, for example, enables customers to easily and automatically improve their energy efficiency: customers sign up for the program with a click, and the system makes a series of background scheduling adjustments to save energy and money.

The approach educates customers just enough so they’ll take action to do something very simple, says Bascom. The company focuses on making it really easy and automating the changes so that customers don’t have to worry about the details. The simpler and faster it is for consumers to understand their energy management, she contends, the easier it will be for companies to change customers’ behaviour and reduce their energy consumption.

Looking forward, Bascom sees enormous potential for better energy usage across the grid as smart, connected devices become increasingly mainstream. Already, thousands of developers are working on products that take advantage of the Nest platform—from dishwashers to LED lighting.

Her ultimate hope is that in 5 to 10 years, homes will have a range of connected devices that all work together to seamlessly shave peak consumption and better align with the time-of-use pricing used in certain Canadian markets. It will not only benefit consumers, she notes: it will help utilities save money by making the best use of their infrastructure investments. “That makes sense for the grid—and the environment,” she says.
Rapid advances in technology and shifting customer behaviours are key drivers of energy sector transformation around the world—but they’re not the only factors. Governments and regulators play a highly significant role in shaping the future of the country’s energy sector. Yet is government policy helping power companies or getting in their way?

**Figure 15: Impact of government and policy regulation on home market (major/moderate impact)**

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<td>2020</td>
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**Figure 16: Which of the following initiatives play a major role in energy transformation in the province in which your company operates?**

- **Renewable energy subsidies**: 66%
- **Conservation**: 48%
- **Subsidies & grants for new technologies**: 39%
- **Market restructuring**: 34%
- **Interconnected & liquid electricity markets**: 21%
- **Customer experience**: 21%
- **Market consolidation**: 21%
- **Unbundling of distribution networks**: 9%
Policy’s influence shouldn’t be underestimated

The connection between policy and energy transformation is certainly foremost on the minds of utility executives. Nearly three quarters of Canadian utility executives (71%) feel changes in government policy and regulation have the most impact on their companies at this point in time, compared to 52% of their counterparts globally (Fig. 15). Policy-influenced initiatives dominate the list of factors driving change, according to Canadian survey respondents, led by renewable energy subsidies (66%), energy conservation measures (48%) and subsidies and grants for new technologies (34%). Looking ahead, they see policy and regulation continuing to play a leading, though less obviously dominant, role in shaping their industry’s future (Fig. 16).

The sheer scale and pace of change in energy markets right now may explain executives’ perspective on policy’s influential role. Climate change policies are being rolled out across Canada in the wake of the Paris Agreement, including a federal initiative to set a price on carbon. Governments are encouraging a greater, faster shift towards renewables and encouraging investment in distributed generation, supply exchanges, storage and more. At the same time, they’re pressuring the energy sector to deliver more efficiency and value. It can be hard for power utilities to keep up—but they have little choice. Government policy flows through almost every aspect of their business, from rates of return to permits to deciding how—or whether—to make major long-term investments. It’s an environment where being able to stay flexible and adaptable as an organization is going to be key.

Is policy helping energy companies innovate?

The majority of Canadian utility executives believe they’ll be operating under a very different market model by 2040, though they differ on what the model will look like. Seventy-seven percent of executives expect a green, command and control energy market is likely by 2040, in which government plays a dominant role, mandating investments in distributed generation, renewables and digital. Sixty-six percent foresee an ultra-distributed generation model, where both generators and customers have invested in distributed renewable generation, with investment decisions based on policy incentives and/or economic business cases. Sixty-one percent believe regional super grids—a pan-national market distributing renewable and bulk power through large, interconnected grids—are likely (Fig. 17).
Innovation will be critical. Is policy helping companies innovate, or hindering them? Both, it seems. Government policy may be encouraging innovation, but regulatory frameworks haven’t necessarily caught up. These frameworks need to start somewhere—for example, carbon or climate change. Once this objective is established, it flows through the industry to address everything from permitting, returns, renewables, engagement of customers, security of investments, and so on—a cascade effect.

Policy plays a significant role in determining what the future of the industry is going to look like, according to Francis Bradley, Chief Operating Officer at the Canadian Electricity Association (CEA), but it’s not necessarily helping companies get there.

The issue, as Bradley sees it, is the gap between governments’ aspirations around climate change, emissions and other matters, and the decisions made by regulators. “The regulators’ mandate is very specific, and it doesn’t take into consideration things like how to fund innovation,” he says. The CEA has many members keen to try innovative initiatives, says Bradley, but they’re outside the scope of what a regulator can approve. This may explain why 57% of utility executives feel their regulator is “holding them back” (Fig. 18).

“We don’t have the regulatory tools to be able to fund it, or put it into the rate base, or move forward with it,” he says. “There have only been a couple of minor steps that have been taken in that direction.”

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Does affordability matter?

While acknowledging the importance of pushing for greater use of renewables and more widespread adoption of new energy technologies, Canadian utility executives are adamant that energy affordability must come first. Four out of five respondents (82%) believe provincial governments need to make energy affordability their top policy priority. Encouraging distributed generation and other innovative technology follows, at 68%, while driving growth of renewables trails at 52%. Only 21% feel enhancing customer service should be a government policy priority, perhaps indicating that companies feel this area is better left to them, rather than their overseers.

But affordability is relative, especially in Canada (Fig. 19). While energy prices vary from province to province—according to hydrorates.ca, 1,000 kilowatt hours per month can cost residential customers as little as CA$81.50 (Quebec) to as much as CA$173.70 (Prince Edward Island)—our prices are actually lower than in many other countries. This may be a factor that gives governments a feeling of freedom to push policies that result in higher energy prices. In considering the energy trilemma, Canadian energy executive respondents feel affordability is a low priority for provincial governments both over the next few years and in the long term. From their perspective, security of supply and the need for cleaner, more sustainable energy will be higher priorities over the next 20 to 25 years. Unfortunately, energy companies will likely need to resign themselves to bearing the brunt of consumers’ ire over rising energy bills, a factor that could drive many companies to redouble their efforts to engage with and deliver a superior experience to their customers.

---

Figure 18: Indicate the extent to which you agree or disagree with the following statements
% reporting strongly/somewhat agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>My company’s business model is evolving at a pace consistent with energy transformation</td>
<td>68%</td>
</tr>
<tr>
<td>My regulator is holding my company back</td>
<td>57%</td>
</tr>
<tr>
<td>My regulator is driving energy transformation</td>
<td>25%</td>
</tr>
<tr>
<td>My regulator is helping lead my company towards the future</td>
<td>18%</td>
</tr>
</tbody>
</table>
To succeed, companies must stay lean—and be part of the policy conversation

With government policy such a fundamental influence on their business—and one largely out of their control—Canadian energy companies must make the most of other areas to sustain revenues and profitability in a changing market. A focus on operational excellence is essential, and companies should closely examine their cost structures and work to keep the business as lean as possible. Embracing new ideas on how work gets done and capitalizing on mobile, analytics and other technologies will play a vital part in this drive. At the same time, companies can look to capitalize on their unregulated businesses to grow revenues, which can then be used to fund improvements to business process and operations—or help keep customers' energy prices down.

Climate change and emerging energy technologies are likely to continue to shape government policy and, thus, energy companies’ own business for some time. But that doesn’t mean energy companies can’t participate in conversations about energy policy. In fact, it’s essential that they play an active, collaborative role in those conversations: only 18% of utility executives believe their regulator is helping to lead their company towards the future. “Our current policies are not aligned with moving us to become more innovative,” says Bradley.

Energy companies should be using their experience and perspective to help governments make the most informed policy decisions they can and make sure regulators adapt to support the sector’s transformation. In this way, companies can help policymakers point the industry to where they know it needs to go.

To do this successfully, companies must increasingly take on the role of educator and influencer to help governments understand the implications of policy decisions along the energy value chain. And they must have a very clear understanding of where they want to be strategically in a transforming energy market. They also need to be proactive at establishing solid, productive relationships with policymakers, both to understand what’s coming and to educate and inform along the way.

Being part of the policy conversation can help energy companies get what they really need to move forward: certainty. “You want to have certainty with respect to all the business parameters within which you’re operating,” says Bradley. “That’s one of the reasons we’ve been in favour of introducing some kind of clear price on carbon. It give companies clarity in terms of what the operating environment is going to be.”

Figure 19: Average monthly residential electricity bill by provinces (1,000kw per 30 days)

<table>
<thead>
<tr>
<th>Province</th>
<th>Bill (1,000kw per 30 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>$102.23</td>
</tr>
<tr>
<td>Alberta</td>
<td>$98.52</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>$153.49</td>
</tr>
<tr>
<td>Manitoba</td>
<td>$93.91</td>
</tr>
<tr>
<td>Ontario</td>
<td>$162.91</td>
</tr>
<tr>
<td>Quebec</td>
<td>$81.50</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>$138.97</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>$141.38</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>$173.70</td>
</tr>
<tr>
<td>Newfoundland</td>
<td>$141.57</td>
</tr>
</tbody>
</table>

Source: hydrorates.ca
Innovation
At the heart of energy transformation

The transformation of the energy sector both in Canada and around the world will have a profound and lasting impact on this country’s energy utilities. Various factors including technology advances are leading to major changes in the energy supply mix. Customer expectations are shifting. Governments and regulators are taking an active role in reshaping energy markets. Little wonder, then, that 43% of the executives we surveyed believe that existing utility business models simply aren’t sustainable in this environment of rapid change (Fig. 20).

43% believe current business models won’t be sustainable with energy transformation, but the change can be gradual.

Figure 20: Business model sustainability through energy transformation

Figure 21: How do you view the disruptive power of energy transformation?
Respondents reporting major/moderate disruption

PowerStream: “Fresh thinking that creates value”
Featuring
Neetika Sathe
Vice President of Corporate Development,
PowerStream

Toronto Hydro: Innovative & affordable energy storage
Featuring
Jack Simpson
Vice President of Generation & Capacity Planning, Toronto Hydro

96%
30%
Short-term (through 2020)
Long-term (through 2040)

www.pwc.com/ca/energytransformation
It’s increasingly clear from our survey that the traditional energy-sector business model—investing in capital assets, and generating a rate of return on those assets for years, if not decades—may no longer be viable. Virtually all the utility executives we surveyed (96%) believe advances in technology, coupled with changing customer needs and other factors, will cause moderate—if not major—disruption in their industry (Fig. 21).

To remain competitive, profitable and successful, energy companies across Canada need to embrace change, new ideas and new processes throughout their business. Unfortunately, the power and utilities sector has long trailed behind other sectors in terms of its capacity and capability to innovate. This is perhaps due in part to decades of slow-changing technology platforms and stable customer expectations, but it also reflects the fact that in Canadian markets governments and regulators have often rewarded what were perceived to be low-risk, proven approaches and investments.

In this new world of fast-moving technology and ever-changing customer expectations, this won’t work—Canada’s utility companies need to pursue an agenda of innovation. Based on our survey responses, executives appear to recognize this need. Sixty-eight percent believe encouraging innovative technology should be a policy priority in their market (Fig. 22). “Innovation is key,” says Jack Simpson, Director of Generation and Capacity Planning at Toronto Hydro. “It will help us move towards some of those productivity, reliability and cost goals that are set ahead of us. It will help us improve as a business.”

Utilities need to create a culture where everyone from the field worker and customer service clerk to the C-suite is searching for ways to do things better, faster and more efficiently.

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**Figure 22: Which of the following objectives should be a priority for your province’s energy policy?**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making/keeping energy affordable</td>
<td>82%</td>
</tr>
<tr>
<td>Encouraging innovative technology and/or distributed generation</td>
<td>68%</td>
</tr>
<tr>
<td>Securing energy supplies for the future</td>
<td>57%</td>
</tr>
<tr>
<td>Promote energy efficiency to reduce energy consumption</td>
<td>55%</td>
</tr>
<tr>
<td>Encouraging development and growth in renewables</td>
<td>52%</td>
</tr>
<tr>
<td>Cross-jurisdictional energy policy and/or grid interconnection</td>
<td>50%</td>
</tr>
<tr>
<td>Mitigating the environmental impact of the energy system</td>
<td>41%</td>
</tr>
<tr>
<td>Enhancing customer service</td>
<td>21%</td>
</tr>
<tr>
<td>Connecting new customers to electricity and/or natural gas</td>
<td>18%</td>
</tr>
<tr>
<td>Other</td>
<td>7%</td>
</tr>
</tbody>
</table>

To do things better, faster and more efficiently at lower costs and to serve customers in new and engaging ways.
There are three types of innovation:

- **Incremental innovation**, which focuses on continuously improving common, existing business processes such as work scheduling and customer service. Most companies have been doing this, on some level, for years.

- **Transformational innovation**, which rethinks how, when and where work gets done, often capitalizing on technology. Examples include providing field staff with tablets and mobile technology to improve communication and reduce down time.

- **Breakthrough innovation** is about game-changing ideas, new technologies, new services and even new businesses. And while there may not be any big examples of this yet, there will be—though whether they will come from energy companies remains to be seen.

Innovation, in this context, isn’t necessarily just about building new infrastructure—at least not on the scale power and utility companies are used to. Rather, it requires also adopting a customer-centric view of the market and identifying how to better anticipate and meet customers’ emerging needs and deliver the experience they want.

Three quarters of respondents (75%) felt innovation around grid, generation or other core operational technology will be most important to the future of the energy sector’s business model. Executives also felt behind-the-meter (41%), product (36%) and consumer (34%) innovation will play important roles (Fig. 23).
Neetika Sathe, Vice President of Corporate Development at PowerStream, points out that creating a culture of innovation comes in many shapes. “Everyone generally thinks innovation is all about big, breakthrough, revolutionary ideas,” she says, but the company stresses a broader vision that values all kinds of innovation as well. From small process improvements to make it easier to work from home to tweaks to accounts receivable, processes to improve vendor relationships or better online bill payment and web experiences for customers, Sathe says, “innovative behaviour can reside in any department.”

Many question whether power and utility companies can innovate and keep power affordable. In our view, innovation and affordability aren’t mutually exclusive but can in fact be complementary, especially when companies approach innovation with a customer-centric mindset. Those that embrace innovation in the area of customer experience and digital technology to help customers manage and reduce energy usage, for example, may find their market share growth offsets the potential drop in energy-related revenue. Energy consumers are eager for new ideas and solutions: 89% of consumers we surveyed are interested in products to reduce their energy consumption.

The reality is that energy companies have little choice but to innovate. Centralized and distributed renewables are confounding skeptics by providing a growing proportion of supply in many markets around the world and making fast progress in local markets like Ontario. Storage technology is advancing rapidly, and 86% of executive respondents believe it will have a moderate or major impact on the energy market (Fig. 24). Self-generation is within the reach of residential and commercial customers as well as major industrials. Given this, without the ability to engage innovation and new approaches to creating value, energy companies will find it increasingly difficult to adjust their way of working and potentially even struggle to justify ongoing rate increases for customers who perceive themselves as using less and less utility services.

And if energy companies don’t innovate, someone else will—a fact global utility executives appear more concerned about than their Canadian counterparts. While 66% of global executives expect strong retail, technology and telecom brands to pose a competitive threat over the next 25 years, only 36% of Canadian respondents feel the same way (Fig. 25). It may be that Canadian utility executives believe Canada is too small and decentralized a market to attract non-traditional players’ interest, or believe themselves protected by the country’s ownership or regulatory model.

But, new competitors may enter the market in unexpected ways, especially those with a deep understanding of customer behaviour based on data-driven customer insights. Telecom companies that already provide home security monitoring, for example, may build on that to offer their customers home energy monitoring as well. Should new entrants seize such emerging opportunities first, energy companies may find themselves cut off from new avenues of profitable growth.

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Energy consumers are eager for new ideas and solutions: 89% of consumers we surveyed are interested in products to reduce their energy consumption.
Élie Saheb, Hydro-Québec’s Executive Vice President of Corporate Development, Strategic Planning, is blunt about the future for the public utilities sector. He foresees big changes in companies’ business models, driven by the rising use of renewables and the falling cost of new technologies.

“Rising CO₂ levels, lower renewable energy pricing and the emerging concept of energy independence all signal the beginning of decentralization in the energy sector. The momentum isn’t losing speed. The impact on public utilities will be enormous,” he says.

In his view, companies focused on innovation stand to benefit most from the changes in the energy sector. It’s vital for energy companies to understand, adapt to and incorporate new technologies into their business model. “You can’t fight progress,” he remarks. “We need to stray from the beaten path. Change will come via legislation if we don’t adapt quickly enough.”

At Hydro-Québec, the company is already at work transitioning from being a power utility to participating as an integrated player in a more decentralized energy ecosystem. Overhauling the corporate culture is one of the major challenges ahead.

“The main goal is still to serve our clients, but the way forward has split into several paths. We have to figure out the best way to provide the best service. Clients have more choices now, and we have to find new ways to keep them satisfied,” he says.

Data-driven customer insights will play a key role, he adds. Saheb points to Google and Amazon as examples of companies that excel at turning vast stores of data into outstanding customer service and relates that to Hydro-Québec’s future. The more the utility knows about its clients’ needs, the easier it will be to adapt its production to consumption patterns and geographic environments; large real-estate owners are already providing the company with consumption data in efforts to control peak demand. Launching such efforts now will help position Hydro-Québec at the forefront in using data to benefit residential customers—hopefully fending off upstart competitors.

A changing energy market means power utilities need to embrace innovative—and sometimes surprising—ideas on how to sustain growth in the years to come. Hydro-Québec is launching a project to provide turnkey data centre solutions for business customers that incorporate land, labour, subsidies, fee schedules, permits and more. The company is also turning its research into a source of revenue, marketing the work of L’Institut de recherche d’Hydro-Québec (IREQ) to other interested utilities around the world.

The energy market may be transforming faster than anyone could have imagined, but Saheb is confident that Hydro-Québec will be able to adapt, innovate and stay competitive in the years to come.

For Saheb, solar power is the game-changer. It’s more predictable than wind, the technology is rapidly improving and costs are falling to within range of wind. Moreover, its flexibility and adaptability make it easier to integrate into communities. As renewables become ever more economically viable and other technologies advance, traditional business models no longer work.

“Large-scale projects with important capital costs cannot be the only solution anymore,” says Saheb. “Ten-year building projects are more risky because of the rapid rate of technological change. We need a more agile model that can adapt to various infrastructures and energy needs.”

“Large-scale projects with enormous capital costs are no longer feasible. Demand for them has crashed. Ten-year building projects don’t make sense anymore because of the rapid rate of technological change. We need a more agile model that can adapt to various infrastructures and energy needs.”

- Élie Saheb, Hydro-Québec
Embracing a transformed energy future

The transformation of Canada’s energy market has only just begun. Over the next 25 years, power and gas companies in Canada and around the world will experience a relentless, fast-moving wave of change. They’ll find themselves shaping—and being shaped by—a future unlike anything they’ve seen.

To thrive in this shifting, uncertain future, power companies and utilities will need to move away from the business models that have sustained their businesses for decades. They’ll need to embrace new ideas, new approaches and new technologies. They’ll need to instill a spirit of innovation within their organizations, and work with partners and policymakers to create conditions in which innovation can succeed. And they’ll need to engage customers on an entirely new level, harnessing data and dialogue to better understand customers’ ever-evolving needs and creating solutions to meet them.

The years to come will be challenging ones for Canada’s energy companies—but we’re confident they’ll rise to the occasion, find their way forward and be vital players in our energy future.
Methodology

About our research

Our energy executive survey was designed to collect insights into the challenges and trends affecting Canada’s power sector both nationally and provincially—as well as identify the disruptive forces changing the country’s energy landscape. Forty-four Canadian utility executives completed our online survey between February and May 2016 (Fig. 26). Respondents represented companies operating in the BC, Alberta, Saskatchewan, Manitoba, Ontario, Quebec and Nova Scotia energy markets (Fig. 27).

Figure 26: Position of utility executive respondents

- Business owner, partner or director: 34%
- EVP or VP level executive: 52%
- Director level or other senior manager: 9%
- Manager: 2%
- Other: 2%

Figure 27: Location of utility executive respondents

[Map showing distribution of respondents across different provinces with percentages for BC, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Nova Scotia.]
Our energy consumer survey was carried out to provide a clearer view of customers’ role in energy transformation, their relationship with their energy providers, and customer-centric challenges in the power and utilities space. We conducted the online survey of 1,504 energy consumers, representing all Canadian provinces, in January 2016 (Fig. 28, Fig. 29). Survey participants were drawn from an online panel of more than 475,000 members across Canada. A probability sample of the same size would yield a margin of error of +/- 2.5%, 19 times out of 20.
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